Technology Innovation Project

Project Brief

TIP 275: New Remedial Action Scheme (RAS) Research Work to Avoid Cascading Caused by Intermittent Output of Renewable Energy Resources

Context

In the future power system, increased penetration of variable renewable energy resources (VERs) and electric vehicles (EVs) is expected to increase power system dynamics, especially disturbances. VER operation and EV charging during a power system disturbance may affect conventional operation of remedial action schemes (RAS).

Current expectation is that synchrophasors, when deployed by the hundreds, will increase the amount of energy that can be reliably transmitted on the transmission grid, necessary if North America is to integrate more wind and solar power, and add a significant control tool to the operational repertoire. This study is aimed to better understand syncrophasor data application. Most existing telemetry reporting devices report once every two to four seconds; synchrophasors report back 30 times a second, and with a time stamp, so all reports can be synchronized and control center computers can be clear on the sequence of events.

Description

Hitachi studies promise feasible new remedial action schemes (RAS) using synchrophasors and online contingency analysis. By using synchrophasor monitored data from power plants and substations, RAS can periodically simulate dynamics of contingencies such as lightning and other disruptive system disturbances.

Voltage drop caused by a fault can produce excessive RAS generator shedding. If actual power flow is monitored after a fault by synchrophasors, the amount of generator shedding may be reduced. The proposed RAS would use online contingency analysis to quickly determine the first generator-shedding amount (less than 200 ms). Then it would use syncrophasor data for post event remedial actions such as additional generator shedding if necessary, and exert reactive power control by switching capacitor banks to mitigate voltage drop called Fault Induced Delayed Voltage Recovery (FIDVR).

This research consists of three steps in FY2013. Hitachi will submit a deliverable at each step, and will transition to the next step based on the results of the previous step.

Step 1: Syncrophasor data analysis

Step 2: Simulation research - the output is a transient stability study for each case.

Step 3: Developing concept of new RAS

Why It Matters

New RAS developed in this project can provide BPA more flexible and optimal generator operations. New RAS would reduce fuel cost and transmission line loss.

Current excess generator shedding may lead to additional load shedding that causes financial damage to customers. The technical key to this project is accuracy of simulation, which is the basis for determining necessary generator shedding. Hitachi expects that such new RAS would reduce the required amount of generator shedding in case of a fault, thus minimizing the outage area. With more frequent sampling accomplished by synchrophasors, grid operators can see disturbances as they begin to develop, and take compensating actions, like shifting the location where power is being added to the system.

The new RAS could also raise the effective total transfer capability in transmission lines. This enables more effective transmission line use and allows more renewable energy resources to be installed remotely. Raising effective total transfer capability can reduce new transmission line construction cost. Further, in a blackout, synchrophasors could also determine which failures came first, and which were merely effects of the first failures, making it easier to establish where the disturbance began.

Goals and Objectives

Feasible new remedial action schemes (RAS) using synchrophasors and on-line contingency analysis will be studied.

- Better manage RAS-initiated responses to system disturbances
- Minimize excessive RAS generation drop

TIP 275: New Remedial Action Scheme (RAS) Research Work to Avoid Cascading Caused by Intermittent Output of Renewable Energy Resources

Project Start Date: October 1, 2012

Project End Date: September 30, 2013

Reports & References (Optional)

Links (Optional)

Participating Organizations

Hitachi America, Ltd

.

Funding

Total Project Cost:	$224,986
BPA Share:	$112,493
External Share:	$112,493
BPA FY2013 Budget:	$112,493

For More Information Contact:

BPA Project Manager:
Gordon Matthews, ghmatthews@bpa.gov